

FAST, RELIABLE, UNIVERSAL Corbett Recounts Quest for Covid Vaccine

BY CARLA GARNETT

Long before Covid-19 became a global crisis, scientists at NIH's Vaccine Research Center were examining the fundamental mechanics of coronaviruses. Already the world had witnessed the damage SARS and MERS could do, and veteran virologists knew it was only a matter of time before the next threat emerged. VRC investigators had devised a strategy, however, and their proactive research provided a much-needed jumpstart in the race for a vaccine.

Recounting those efforts, Dr. Kizzmekia Corbett, a senior research fellow who's

spent the past 6 years working with VRC strategists in NIAID's Viral Pathogenesis Laboratory (VPL) and who's become a central figure in covid vaccine science, recently discussed "SARS-CoV-2 mRNA Vaccine Development Enabled by Prototype Pathogen Preparedness."

She said three key words describe her group's approach—fast, reliable and universal.

"The way we think about coronavirus vaccine development is fairly simple," Corbett explained during her recent virtual Covid-19 scientific interest group lecture. "Because coronavirus is always poised for human emergence, we need a vaccine that is fast—something that has the technology to be produced in vast quantities very quickly...Also reliable—a technology that has been tested in humans and upholds some level of manufacturability standards...[and

SEE CORBETT, PAGE 4



Dr. Kizzmekia Corbett is a central figure in covid vaccine science.



Pre-covid dreamscape lures NIH'er; see p. 12.

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Copper's Antimicrobial Properties Might Treat Bacterial Diseases

BY ERIC BOCK



Dr. Michael D. L. Johnson

toxic to bacteria," said Johnson, assistant professor at the University of Arizona's

Doctors might one day use copper's antimicrobial properties to treat bacterial diseases, said Dr. Michael D. L. Johnson at a recent NIGMS Director's Early-Career Investigator Lecture.

"Copper is universally

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WOMEN IN SCIENCE

Four Scientists Discuss Balancing Work, Life During Pandemic

BY DANA TALESNIK



Dr. Gisela Storz

Many ingredients go into the stew of life. Women with demanding careers try to take equal parts work and family time, mix in adequate sleep and exercise and sprinkle in some personal time. Often, though, certain areas of our lives heat up

while others sit on a slow simmer. In normal

SEE WOMEN, PAGE 8

Donate Use-or-Lose Hours to NIH Leave Bank by Jan. 2

In 2019, NIH employees lost an estimated \$3.5 million in annual leave. Don't lose yours. The Leave Bank offers you the opportunity to put that leave to use by donating your use-or-lose leave to the bank by Jan. 2, 2021, via ITAS. When you donate to the Leave Bank, you help a co-worker in need, like this recipient:

"Words cannot express my gratitude for the leave bank. My son has a very serious (and terminal) illness, resulting in many hospital stays, as well as multiple surgeries. Knowing that the leave bank is available gives me the peace of mind to know that remaining in pay status is something that I no longer have to worry about and that I can put all my attention and care where it should be, with my son. From our family to yours, thank you for helping us through this very difficult time."

To donate, log in at <https://itas.nih.gov>. On the tool bar, select "Donate to Leave Bank." Enter the type of leave (annual or restored annual), then the number of hours you wish to donate, and select "OK."

More information on the program can be found at <https://hr.nih.gov/leavebank>. For questions, call (301) 443-8393 or email LeaveBank@od.nih.gov.

Dec. 14-16

ORWH Marks 30th Anniversary with Virtual Meetings

The Office of Research on Women's Health (ORWH) is hosting 3 virtual meetings to celebrate 30 years of women's health research and sex and gender studies within and beyond the NIH scientific community. The meetings, ORWH's 30th Anniversary Virtual Meeting Series: Advancing the Health of Women Through Science, will be held Dec. 14-16 and will convene researchers on the health of women and sex differences as well as members of two signature ORWH programs: Building Interdisciplinary Research Careers in Women's Health (BIRCWH, pronounced "birch") and Specialized Centers of Research Excellence (SCORE) on Sex Differences.

- BIRCWH annual meeting, Dec. 14, 10 a.m. - 5 p.m.—Celebrating its 20th anniversary, BIRCWH is a mentored career-development program connecting junior faculty, known as BIRCWH scholars, to senior faculty with shared interests in women's health and sex differences research. The annual meeting brings BIRCWH scholars and faculty together to share research and experiences. The 4th Ruth L. Kirschstein Memorial Lectureship will focus on the importance of and improvements made in mentoring young investigators. The plenary session will also include presentations on research findings by leading BIRCWH scholars. A special "Innovation Talk" to celebrate the 20th anniversary of the BIRCWH program will close the session.



NSO Ensemble Entertains at CRC

The National Symphony Orchestra Ensemble brought live music once again to the Clinical Center atrium on Nov. 19. The concert featured (above, from l) NSO concertmaster Nurit Bar-Josef (violin), Dayna Hepler (violin), Daniel Foster (viola) and Britton Riley (cello). They performed works by Beethoven, Brahms and several newer composers.

PHOTOS: DEBBIE ACCAME



- ORWH 30th anniversary scientific symposium, Dec. 15, 9:30 a.m. - 5:30 p.m.—This symposium will feature opening remarks by NIH director Dr. Francis Collins, a keynote address on women's mental health across the life course and a panel of directors from several NIH institutes and centers discussing their perspectives on women's health. Additional presentations will discuss high-priority women's health topics, such as applying the principle of studying sex as a biological variable across scientific disciplines.

- SCORE annual meeting keynote address, Dec. 16, 10:40-11:30 a.m.—A signature program of ORWH, SCORE is the only NIH cooperative program supporting disease-agnostic research on sex differences. Each center in the SCORE program serves as a national resource for translational research, at multiple levels of analysis, to identify the role of biological sex differences on the health of women. At this year's SCORE annual meeting, Dr. Jocalyn Clark, executive editor of *The Lancet*, will present the keynote address "Sex Differences Research and the Health of Women: An Editor's Perspective." Note that only the keynote address is open to the public; the remainder of the event is a business meeting of SCORE investigators.

More information is available at <https://orwh.od.nih.gov/about/newsroom/events>.

NIAID's Awwad Gets Fauci Ready for Prime Time

BY CLAUDIA WAIR

When NIAID director Dr. Anthony Fauci appears on television, social media or any other virtual platform, David Awwad—NIAID's IT campus field manager—is the person who makes that appearance possible.

During the past year, as Covid-19 forced many NIH staff and others across the United States to work remotely, Awwad has been an invaluable partner enabling Fauci to share important public health information broadly with the nation. A University of Maryland graduate with a B.S. in information systems management, Awwad has worked at NIAID for more than 16 years and supervises 29 other NIAID IT staff.

Once Fauci is scheduled to appear on the news, give prepared remarks or participate in a fireside chat, Awwad gets in touch with the other organization's technical team to determine what platform will be used, consider different time zones and schedule testing for audio and video. Sometimes there's a teleprompter to set up or slides to accommodate. This all takes place on a tight schedule, often with back-to-back appearances. Awwad has, as of mid-November, helped Fauci make more than 1,500 appearances. Working early mornings, late nights and weekends, he has become Fauci's one-man audio-visual and IT resource.

Fauci appreciates how critical Awwad's dedication is to his public appearances. "During the Covid-19 pandemic, David has stepped up in an exceptional way, helping me and my office stay connected to the world with his technical skills and his commitment to the institute and our mission," he said. "His skill, good humor and willingness to work long hours have made him a true NIAID hero over these past grueling months."

There are numerous details involved in getting ready for Fauci's remote appearances. The requesting organization could employ any one of multiple platforms.

"A lot of them are easy to use," said Awwad, "but



David Awwad



NIAID director Dr. Anthony Fauci takes part in a podcast with Alan Alda.

making sure the hardware and the technology work together properly, finding the right camera angle, checking the lighting and sound is where things get complicated." All the skills required in proper camera work, lighting, sound and teleprompter use Awwad taught himself.

The process has evolved since Covid-19 first required frequent remote appearances. "When we started in January, we were in a very small room, working with only a laptop and a webcam," said Awwad. Then the operation moved to the NIAID conference room, where they acquired a laptop stand, proper lighting for the room and a backdrop. Awwad does a test before Fauci arrives. Vital to the operation is "keeping track of the time, because sometimes there are back-to-back-to-back sessions," he adds.

Awwad also goes to Fauci's home to make sure all his equipment there works and is secure.

In addition to live events, Fauci must also record podcasts and prepare pre-recorded videos for various events. To do this, Awwad had to learn how to edit video. "There is a lot involved. It's not just pushing a button. I make sure I do all the prep work, so that he can just come in and sit in the chair."

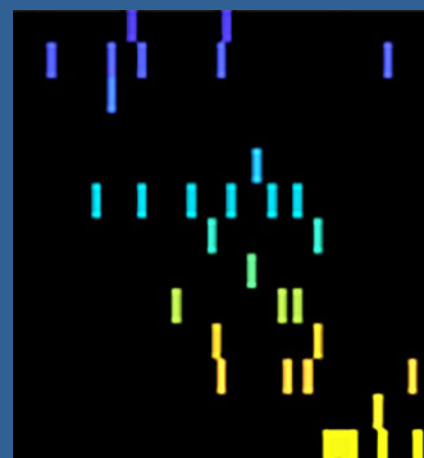
All this work is in addition to Awwad's regular day-to-day IT manager duties. He is grateful that his team has stepped up to the challenge. Instead of rotating other staff to work with Fauci, he takes on the task himself, to lessen the chance of spreading Covid-19 infection.

Awwad has encountered several situations that required quick thinking. When the president visited the NIH campus in March, Awwad had to set up the computers for the presentation. Issues with the machines developed, and he had to navigate

security to return and address the problem. "Being available, taking care of the issue right away and staying calm is the key," he says.

When Fauci was on *The Daily Show*, the recording failed on their end. Fortunately, Awwad had recorded the interview and was able to give them his backup footage.

Awwad's wife, Ana, also works at NIH and understands the extended hours he's had to work. The long hours have meant less time spent with his three children. Even so, he says, "It's been a pleasure. I'm learning a lot for a good cause. It's been challenging, but at the end of the day we are working towards progress against Covid-19." **R**



ON THE COVER: Neuronal firing patterns. NIH researchers found that our brains may store memories in neuronal firing patterns that are replayed fractions of a second before remembering.

IMAGE: ZAGHLOUL LAB, NINDS

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Corbett

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lastly] universal—not necessarily preemptive and totally protective against all future outbreaks, but something that could at least provide a ‘plug-and-play strategy’ if an outbreak should occur.”

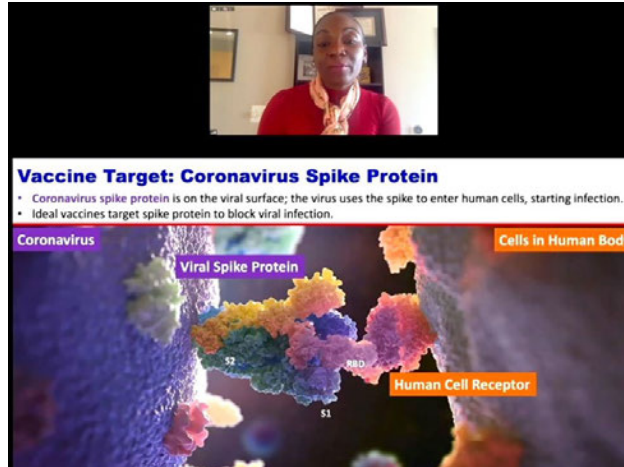
Decidedly Fast

To appreciate how quickly the VRC vaccine made it to clinical testing, you have to look back at inoculation history and the stages of modern vaccine development.

Often it takes 10 to 15 years to put a vaccine in place. The exploratory and pre-clinical stages alone can last up to 6 years or more. Covid-19 couldn’t wait that long.

“It goes without saying that the 2019 emergence of SARS-CoV-2 has been devastating—this pandemic has caused over 38 million cases worldwide,” Corbett acknowledged, describing the “prototype pathogen approach to pandemic preparedness.”

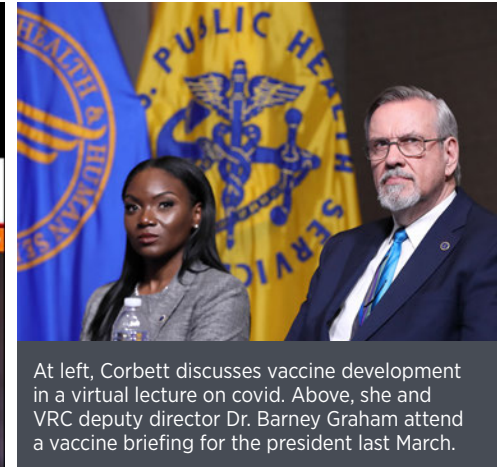
Using that method, she said, researchers choose “a prototypic virus from among the 24 viral families that have the potential to infect humans, study in depth the immunogenicity and development of a vaccine for one of the viruses in that family and [thereby] generate enough knowledge that



can be applied widely across viruses within that family.

“The work we’ve done on SARS-CoV-2 is a proof of concept for that approach,” she continued. “I like to call it the plug-and-play approach, but the basic idea is that we had so much knowledge based on previously done work by ourselves and other labs that we were able to pull the trigger on vaccine development and start the ball rolling toward a phase 1 clinical trial.”

The Covid-19 respiratory illness outbreak was reported in Wuhan, China, on Dec. 31, 2019. On Jan. 10, researchers published the sequence of the novel coronavirus that causes covid; 66 days later, on Mar. 16, the VRC vaccine candidate “mRNA-1273,” which was developed in collaboration with biotech



At left, Corbett discusses vaccine development in a virtual lecture on covid. Above, she and VRC deputy director Dr. Barney Graham attend a vaccine briefing for the president last March.

firm Moderna, entered phase 1 clinical testing in humans.

Determined Reliable

Corbett’s boss, VRC deputy director Dr. Barney Graham, a veteran virologist who also serves as VPL chief and an architect of NIAID’s Prototype Pathogen Preparedness Plan, introduced Corbett’s lecture.

“For the past 6 years,” he said, “her work has focused on coronavirus biology, especially spike structure, antibodies, mechanisms of neutralization and vaccine development...[her team] made the first spike protein that was the basis for diagnostic assays, antibody discovery and vaccines. She’s been central to the development of the mRNA vaccine and Lilly monoclonal antibody that were the first to enter phase 1 and phase 2 trials in the U.S.”

As the vaccine immunobiology unit’s team leader for coronavirus research, Corbett credited scientific groundwork for mRNA-1273’s virtual sprint to clinical trial.

VRC investigators and colleagues, she noted, were able to “use new technology to continuously transform vaccinology in both precision—by understanding structure-based vaccine design and protein engineering of nanoparticles, and speed—by employing different platforms to deliver the antigens that can be manufactured quickly, like messenger RNA.”

Corbett’s group chose the coronavirus spike protein as a vaccine target. The protein is located on the viral surface and the virus uses the spike to latch onto and bind to the host cell.

Designing ‘Universal’

Over the course of about 50 minutes, Corbett led viewers through the basics of



During a visit in March by the president (second from r) to a lab in NIH’s Vaccine Research Center, NIAID director Dr. Anthony Fauci (c) describes the VRC’s efforts to combat the novel coronavirus. Enjoying the light moment are (from l) Graham, NIH director Dr. Francis Collins, HHS Secretary Alex Azar and Corbett. Mask-wearing had not yet been recommended at the time of this event.

PHOTOS: CHIA-CHI CHARLIE CHANG



Less than 2 weeks after the president's briefing, the VRC vaccine candidate began phase 1 clinical trials. Said Corbett during her recent lecture, "I like to call it the plug-and-play approach, but the basic idea is that we had so much knowledge based on previously done work by ourselves and other labs that we were able to pull the trigger on vaccine development and start the ball rolling toward a phase 1 clinical trial."

coronavirus spike structure and function, and detailed the step-by-step research that led to the 2-dose vaccine known as mRNA-1273.

She also shared some positive initial findings from two phase 1 clinical studies: importantly, the vaccine, then in phase 3 efficacy testing, drew strong immune responses in both younger and older adults.

For Corbett and colleagues, however, a universal vaccine that can battle multiple coronaviruses on many different fronts remains their holy grail. Toward that end, she said her team foresees finding ways to optimize antigen designs so that they latch on to more potent immune system handles and to use gene-based delivery so vaccine manufacturing timelines can be shortened.

"While we were able to elicit robust responses [with mRNA-1273]...those responses were largely monospecific to the particular virus," she concluded. "We have some hypotheses around that, but essentially as we think forward in coronavirus vaccinology, it'll be important to not just start on the onset of a pandemic with what are universal strategies for vaccines, but to think outside the box to eliciting more cross-reactive and cross-protective immune responses."

A brief Q&A session followed her talk. To watch the full lecture, visit <https://videocast.nih.gov/watch=38864>. **R**

Brown Named Director of National Center on Sleep Disorders Research

FORMER AAAS
FELLOW

Dr. Marishka Brown has been named director of the National Center on Sleep Disorders Research (NCSDR).

Congress established the center within the National Heart, Lung and Blood Institute in 1993 to coordinate sleep research throughout NIH and other federal agencies. NCSDR serves as a nexus of NIH sleep and circadian research activities for professional associations, public stakeholders and federal agencies.



Dr. Marishka Brown

"After a national search, Dr. Brown emerged as an outstanding choice who captures the key attributes of scientific expertise and program leadership needed to guide the science of sleep and chronobiology into innovative discoveries that improve health," said Dr. James Kiley, director of the Division of Lung Diseases at NHLBI.

Brown joined NCSDR in 2016 and has directed a growing portfolio of sleep medicine and sleep disorder research, ranging from individual fellowship awards to multisite clinical trials.

Throughout this time, she has initiated and led new research programs, such as identifying abnormalities in circadian biology that are linked to heart, lung and blood disorders. She spearheaded workshops and forums that showcase how sleep impacts the immune system, lung diseases, child

development, cardiovascular disease, mechanisms of early neurocognitive decline, the microbiome and health disparities. She also guided NCSDR's coordination of research with other NIH institutes and centers to better understand how sleep problems affect social determinants of health and contribute to health disparities.

In 2018, Brown led an interagency committee to organize a national conference about advances in Sleep and the Health of Women. Hundreds of physicians, researchers and members of the public, including a virtual audience of 1,200, attended. She will continue to chair the working group responsible for national sleep health objectives in the HHS Healthy People 2030 initiative.

Brown started her NIH career as an American Association for the Advancement of Science science and technology policy fellow in the Office of Strategic Coordination, located within the Office of the Director. Her doctorate is in pharmaceutical sciences from the University of Maryland, Baltimore, and she was a postdoctoral fellow at the University of Pennsylvania's Center for Sleep and Circadian Neurobiology, where she led research on the role of the unfolded protein response in age-related sleep changes.

Brown succeeds Dr. Michael Twery, who served as NCSDR director since 2006, during which sleep and circadian research programs increased at NIH and new interagency coordination activities were initiated.

Johnson

CONTINUED FROM PAGE 1

department of immunobiology. “Our body uses copper to kill pathogens.”

For centuries, people have harnessed copper’s antimicrobial properties. They stored food in copper pots. Winemakers use a mixture of copper, slaked lime and water to control fungal infections on grapevines. In hospitals, copper doorknobs and bed frames can help reduce hospital-acquired infections.

Johnson’s lab is studying how *Streptococcus pneumoniae* bacteria, or pneumococcus, responds to copper. They are trying to answer the question: “If you punch bacteria with copper, how does it punch back?”

The bacteria cause many types of illness, including pneumonia, ear and sinus infections, meningitis and sepsis. There are two vaccines against pneumococcus, one for 13 strains and one for 23 strains. However, there are 100 strains and, for many, there are no vaccines. About 1.6 million people die each year from pneumococcus infection, mostly in developing countries.

S. pneumoniae has a copper export system to get rid of the metal quickly. The system

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“A lot of these bacterial systems used to overcome copper stress can be used as therapeutic targets.”

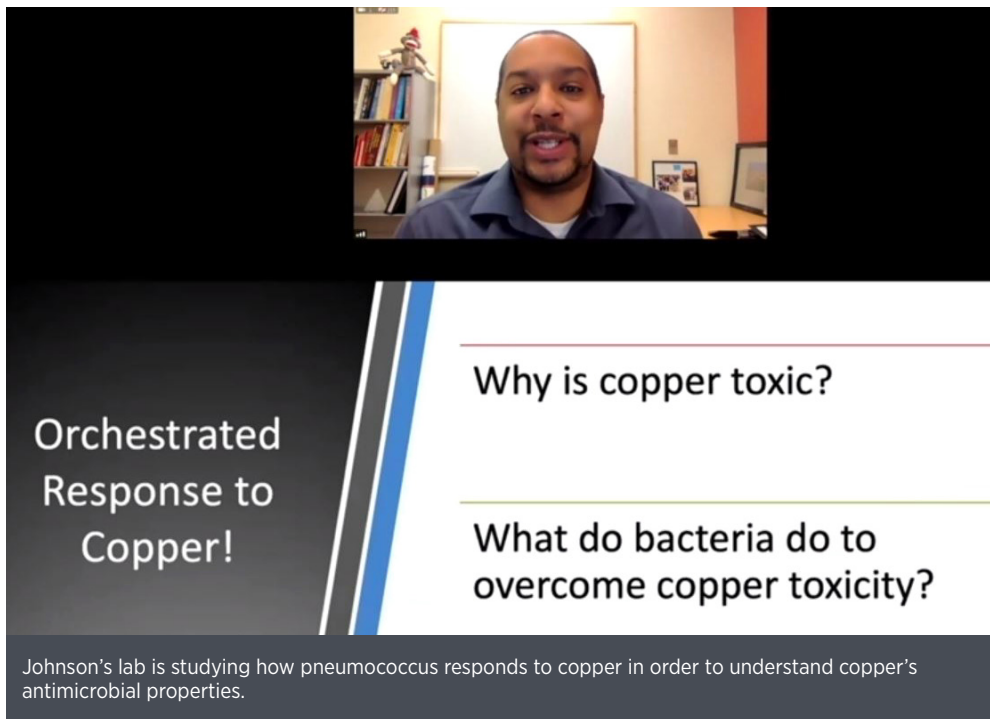
-DR. MICHAEL D.L. JOHNSON

• • •

features the proteins CopY, CupA and CopA. CopY prevents the system from turning on until it senses copper. CupA is a chaperone protein, meaning it guides copper to the exporter protein, CopA, which eliminates copper from the bacteria.

“A lot of these bacterial systems used to overcome copper stress can be used as therapeutic targets,” Johnson said.

Currently, he is trying to determine exactly how the system functions. In one experiment, he hypothesized that CopY is the master regulator of the export system. His experiments showed something different.



“A hypothesis can be proven incorrect. You should always try to prove it incorrect,” said Johnson. “Ultimately, you’re not defined by your hypothesis. If you weren’t correct, that’s okay—as long as you do the experiment to prove or disprove it and get data from it.”

He added: “You have to ask yourself, ‘Well, what are the assumptions that I made that were incorrect?’”

Although his hypothesis proved incorrect, he used the information from the experiment to continue investigating how to stop *S. pneumoniae*’s export system from functioning.

This past summer, Johnson created the National Summer Undergraduate Research Project, which matched 250 black, indigenous and people of color (BIPOC) undergraduate students with microbiology laboratory mentors who can provide remote summer research project experience.

He started the project because many BIPOC students missed out on research

experiences due to the Covid-19 pandemic and due to potential bias in science.

“We’re very excited to move forward with this program,” he said. “We have to adapt the way we’re doing science, especially in these times.”



During the lecture’s introduction, NIH director Dr. Francis Collins (at bottom) said he was very impressed with how Johnson approaches his mission, “to do science and share the excitement with lots of other people.” The talk, aimed at those considering research careers, was followed by a Q&A chat with NIGMS director Dr. Jon Lorsch (upper left).

His lecture, aimed at those considering research careers, was followed by a Q&A chat with NIGMS director Dr. Jon Lorsch. NIH director Dr. Francis Collins introduced the talk.

Johnson received a B.A. in music with a minor in chemistry from Duke University.

He said music gave him the confidence to pursue a career in science because “I was able to really learn how group dynamics work, as far as running a jazz band or being in a marching band.”

Additionally, he knew that, with hard work and practice, he could compete with more talented musicians in blind auditions. He thought he could bring that same mindset into another field.

When he was first hired to work in a lab, the researcher who hired him said, “You’re not the most qualified person for this job, but I figure you had a good ability to learn.”

In graduate school, Johnson’s apartment complex caught fire. The experience had a silver lining—it showed him what a supportive and welcoming laboratory looked like.

“My laboratory was there for me, my mentor was there for me, my department was there for me,” he explained. “People gave me their time, resources and effort. It created this family environment in the lab.”

During his time in school, he learned that not every scientific experience will be “joyful or pleasurable.” These experiences will, however, help “you define what type of researcher you might want to be.”

After Johnson opened his lab in 2016, he soon realized he wasn’t prepared for the human element of management. He advised those who might one day open their own labs to mentor others.

“Doing an experiment on the bench does not teach you how to deal with people. Coming up with a hypothesis does not prepare you to deal with people,” he counseled. “A lot of those things you learn on the fly.”

Finally, Johnson urged students to seek out allies who can help them, whether those are people of color or people of majority.

“Everybody is needed at the table for us to get through,” he said. “No one can do anything alone.” **R**

FORMER NIH POSTDOC RISES

Liu Leads NIMHD Scientific Review Branch

The National Institute on Minority Health and Health Disparities recently welcomed Dr. Yujing Liu as chief of the Scientific Review Branch.

His training includes a medical doctorate from Beijing Medical University and a Ph.D. in molecular genetics from Syracuse University.

After coming to NIH as a postdoctoral researcher, Liu became a staff fellow while pursuing his studies of the genetics of Gaucher’s disease and the molecular regulation of neurogenesis and angiogenesis. Subsequently, he joined the faculty at Georgetown University, establishing a laboratory for the study of molecular genetics and cardiovascular development.

He began his NIH extramural career as a scientific review officer (SRO) at the National Institute of Dental and Craniofacial Research, organizing ad hoc special emphasis panel reviews and reviews by a chartered review committee. Seven years later, he joined the National Institute of Nursing Research as chief of review and the sole SRO. He recruited and trained 3 new SROs to build the NINR Review Branch into an accomplished team of 5 people.

In 2016, Liu joined the Center for Scientific Review as deputy director of the Division of Receipt and Referral and developed a rich knowledge of NIH policy for the receipt and assignment of grant applications. As divisional training coordinator, he managed the CSR Receipt and Referral 101 course, the training of new referral officers, development of a referral trainee website and contributed to the NIH core curriculum training on receipt and referral.



Centralized Website Launches for Covid-19 Clinical Trials

A central web portal called Combat COVID—<https://combatcovid.hhs.gov/>—recently went live.

Launched by the Department of Health and Human Services, in coordination with NIH and Operation Warp Speed, the portal is a one-stop resource to help the public and doctors find information about different stages of Covid-19 illness, NIH-supported Covid-19 prevention and treatment clinical trials, and locations to donate plasma. The website provides clear and easy-to-understand information for:

- People who have never had Covid-19 who may be interested in joining a vaccine or other prevention trial

- People who have Covid-19 and want to participate in a treatment clinical trial

- People who have recovered from Covid-19 who may be interested in donating plasma

- Doctors and other health care providers who want more information to guide their patients who have Covid-19.

Combat COVID Website

- I've Never Had COVID-19: [Join a Prevention Trial](#)
- I Have COVID-19: [Find a Treatment Trial](#)
- I've Recovered from COVID-19: [Donate Plasma](#)
- I'm a Doctor: [Treatment Options and Trials](#)

➤ To develop safe and effective vaccines and medicines for COVID-19, we need people from all age groups, races, ethnicities, and backgrounds to participate in clinical trials.
 ➤ The new Combat COVID web portal has information on COVID-19 prevention and treatment clinical trials and how to donate plasma.
 ➤ Please help us promote this important public health resource.

combatcovid.hhs.gov

Women

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times, it's tough cooking on all these burners at once, let alone during a pandemic.

Four NIH women scientists recently discussed how they're juggling their professional and personal responsibilities amid the altered schedules and uncertainty of the covid pandemic. The virtual lecture, part of the Office of Equity, Diversity and Inclusion's Whole Woman seminar series, was moderated by Dr. Erika Barr, director of community college programs in NIH's Office of Intramural Training and Education, who helped viewers get to know the women behind the science.

Dr. Audrey Thurm, whose three children are in middle school, high school and college, described the challenge of balancing work with being a mom and a wife. "The reality is, for a lot of us, a lot of what we do involves deep thinking and time to actually write," she said. Getting it all done sometimes involves sending emails at unusual hours.



Mom-in action Dr. Audrey Thurm of NIMH with her 13-year-old son, Jonah

Thurm, a child clinical psychologist who directs NIMH's Neurodevelopmental and Behavioral Phenotyping Service, said her schedule continues to evolve during covid times. She used to get more work done after her kids went to bed, but now she gets a lot done while her kids do their virtual schooling.

Dr. Paule Joseph, who is a caregiver to her parents and a chronically ill sister, said she struggles to balance all her obligations.

A Lasker Clinical Research Scholar, NIH distinguished scholar and chief of the sensory science and metabolism unit at NIAAA/NINR, she finds inspiration by surrounding herself with supportive colleagues.

"The way I keep myself balanced and sane is by being diligent about my own spiritual

practice," said Joseph, who meditates daily. She also tries to make time for walks and other activities she enjoys.

Dr. Courtney Fitzhugh finds comfort in her faith. Also a Lasker scholar, Fitzhugh, an NHLBI investigator working on sickle

cell disease, said making more time for her faith has improved her focus and productivity. Recently married, she also prioritizes spending quality time with her husband. The two have spent a lot of time lately bike-riding together on trails behind their house that, she has discovered, go all over D.C.

Dr. Gisela Storz has steadied herself with exercise during the pandemic. "During this covid time, I'm doing an awful lot of walking," said Storz, an NIH distinguished investigator who works on gene regulation at NICHD. "Whenever I'm tired of Zoom meetings, I walk, and I sometimes try to do meetings on the phone while I walk. That's helped a lot."

Until recently, Storz said, she has had severe empty-nest syndrome. Now, during covid times, her three adult children are living at home again. While she enjoys the quality time together, as the dishes pile up



Dr. Paule Joseph

NIH Women Scientists Advocate for Equity

At the EDI Women in Science webinar, panelists also emphasized long-term challenges facing women in science careers.

NHLBI's Dr. Courtney Fitzhugh and NICHD's Dr. Gisela Storz discussed the challenge of gaining respect and equity as women scientists.

A few weeks ago, Fitzhugh—an investigator with a medical degree—was invited to join a committee and speak about her work experience with transplants. On the virtual panel discussion, she recounted, the male doctor speaking before her was properly



Clockwise from upper right: Dr. Gisela Storz of NICHD; moderator Dr. Erika Barr of OITE; Dr. Courtney Fitzhugh of NHLBI; Dr. Audrey Thurm of NIMH; Dr. Paule Joseph of NIDDK and the sign language interpreter

introduced but she felt snubbed when the moderator introduced her as Courtney Fitzhugh, omitting her physician credential.

"I shouldn't have to remind people that I'm where I am today for a reason,

not because I'm a woman, but because I've worked really hard," and earned it, she said.

Storz, when starting her career 30 years ago, remembers hearing the hopeful mantra that the scientific workforce is changing for



At left, Joseph (standing 4th from l) poses pre-pandemic with her team, many of whom, like her, are women scientists. Above, Fitzhugh enjoys biking the trails near her home. Seen here at Lake Artemesia in Berwyn Heights, Md., about 3 miles from her home, Fitzhugh said, "I didn't know this area existed until the pandemic when we started exploring the area more." (Also, she removed her helmet, which she normally wears, for this photograph.)

daily in the sink, she's starting to miss being an empty-nester.

All four women discussed increased feelings of guilt and insecurity during the pandemic. With altered schedules and competing responsibilities, they've wondered: "Have I been a good enough scientist, mom, wife, friend? Am I taking care of myself?"

It's a tough time for parents working at home while managing their kids' school-work at the same time, noted Thurm. Minutes earlier, she shook her head at her

women, becoming more inclusive. Looking back, though, little has changed over the years, she said.

"Something that has frustrated me now, being in this business [a long time] is how glacial the change has been in terms of increasing the number of women in leadership positions, not to mention the people of diverse backgrounds," she said.

"At one point in my career, I was too frustrated by that as well as some inequities regarding space and salaries. I went to NIH leadership and I said, 'There needs to be a committee to look at this.'" Storz helped organize what became the NIH equity committee, established in 2017, to look at salaries, resources and leadership diversity among the institutes and centers.

Lecture moderator Dr. Erika Barr of OITE commended the panelists for their work to inspire women to enter the field.

"One of the impressive things about all

off-camera daughter. "I'm experiencing it at this moment!"

Joseph, who previously lived in New York, said she has grappled with both the grief of losing loved ones to covid and the guilt of being unable to be there to help or attend the funerals. But she finds comfort looking for the blessings in difficult times. "Many times, we rush into the lab, into the Clinical Center, and we don't spend as much time as a family, bonding," she said, appreciating the quality family time of recent months.

"We cannot be doing it all," said Thurm,

of you," she said, "is that you are doers.

Whenever we think about increasing diversity, having that pipeline, often we say we want to diversify and have more women and more people of color," and you're helping to get it done and change the culture.

"We have a lot of work to do...but changes are happening," said NIAAA/NINR tenure-track investigator Dr. Paule Joseph. She has appreciated seeing more women in leadership positions. "It's a great inspiration to be able to see especially senior women scientists and say, 'I can be there one day.'"

NIMH's Dr. Audrey Thurm hopes more women continue entering biomedical science careers. "This is where the action is, here at NIH," she said, "and women need to be in the action. They need to be in it to continue to change attitudes, science and then policy."—Dana Talesnik

who recommended taking mental health breaks. Meditate or take a few deep breaths, step outside, call a friend or put on some music. "Take a moment to recognize ourselves and connect our brains with our bodies," she said. "We have to be in this for the marathon; there cannot be sprints right now."

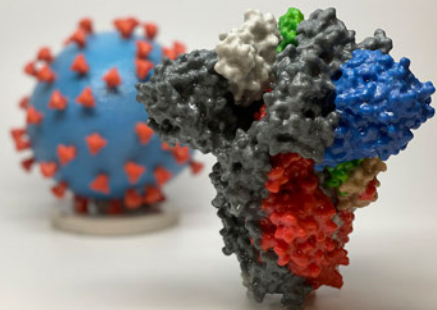
When times get tough, they remind themselves of why they're in this field. One of the greatest rewards, they agreed, is mentoring. Joseph said she finds it especially gratifying to mentor women of diverse backgrounds, "showing that women of science don't all look the same."

Storz, who has worked at NIH for nearly 30 years, has enjoyed watching high school students she once mentored return to NIH as investigators. Fitzhugh agreed: "You're giving others the tools that will help them succeed," she said. "I love that because I'm a woman, that attracts other young women to come. I can see myself in them and it's exciting to go through that process with them."

What advice would they give to young women scientists starting out? Be persistent. Keep trying, keep pushing.

"Learn what you're passionate about, what makes you happy," said Fitzhugh, "so you'll be excited to go to work every day."

Mentoring is particularly important right now, said Thurm, as everyone struggles to balance their lives with their careers during the pandemic. It's important "to be there doing it, showing women that it can be done, being a role model for the next generation." **R**



3-D print of a spike protein of SARS-CoV-2—the virus that causes Covid-19—in front of a 3-D print of the virus particle

NIH-Moderna Covid-19 Vaccine Shows Promising Interim Results

An independent data and safety monitoring board (DSMB) overseeing the phase 3 trial of the investigational Covid-19 vaccine known as mRNA-1273 shared its interim analysis on Nov. 15. This review of the data suggests that the vaccine is safe and effective at preventing symptomatic Covid-19 in adults.

The analysis comprised 95 cases of symptomatic Covid-19 among volunteers. The DSMB reported that the candidate was safe and well-tolerated, noting a vaccine efficacy rate of 94.5 percent. The findings are statistically significant, meaning they are likely not due to chance. Ninety of the cases occurred in the placebo group and 5 occurred in the vaccinated group. There were 11 cases of severe Covid-19 out of the 95 total, all of which occurred in the placebo group.

The mRNA-1273 vaccine candidate was co-developed by the Cambridge, Mass.-based biotechnology company Moderna, Inc., and NIAID. It combines Moderna's mRNA (messenger RNA) delivery platform with the stabilized SARS-CoV-2 spike immunogen developed by NIAID scientists.

The phase 3 vaccine efficacy trial, known as COVE, began under Operation Warp Speed, a multiagency collaboration led by HHS and the Department of Defense that aims to accelerate the development, manufacturing and distribution of medical countermeasures for Covid-19.

More than 30,000 people at 100 clinical research sites in the U.S. are participating in the study, which launched in July. Recognizing the disproportionate impact of the epidemic on underrepresented minority populations,

investigators worked with community engagement partners to enroll a diverse pool of participants. Among trial volunteers, 37 percent are from racial and ethnic minorities.

NIH Research Contributed to First FDA-Approved Treatment for Progeria

Nearly two decades of NIH research helped lead to the first FDA-approved treatment for progeria, a rare and fatal pediatric disease, characterized by dramatic, rapid aging beginning in childhood.

The new treatment was made possible thanks in part to the work of NHGRI researchers, led by NIH director and NHGRI senior investigator Dr. Francis Collins, who identified and characterized the function of the mutant gene and the protein it encodes, called progerin.

The drug Zokinvy (lonafarnib), approved for use in patients 1 year of age and older, helps prevent the buildup of defective progerin.

Before the Nov. 20 approval of this drug, the only treatment options for progeria were supportive care and treating complications arising from the disease.

Progeria, also known as Hutchinson-Gilford progeria syndrome, is caused by a genetic mutation in the LMNA ("lamin A") gene, which helps maintain the normal structure and function of a cell's nucleus.

About 400 children worldwide have been diagnosed with this disease.

Study of 'Exceptional Responders' Yields Clues to Cancer, Potential Treatments

In a comprehensive analysis of patients with cancer who had exceptional responses to therapy, researchers have identified molecular changes in the patients' tumors that may explain some of the exceptional responses. The results demonstrate that genomic characterizations of cancer can uncover genetic alterations that may contribute to unexpected and long-lasting responses to treatment, according to the researchers.

NCI researchers conducted



An 11-year-old female and a 6-year-old male display classic features of progeria.

PHOTO: GENEREVIEWS, UNIVERSITY OF WASHINGTON

the study in collaboration with investigators from other institutions, including NCI-designated cancer centers. The results appeared in *Cancer Cell*.

The study—which defined an exceptional responder as someone who had a partial or complete response to a treatment that would be effective in less than 10 percent of similar patients—included detailed medical histories and tumor samples from 111 patients with various types of cancer who had received standard treatments, such as chemotherapy.

The patients had been identified by NCI's Exceptional Responders Initiative, a national project launched in 2014 to explore the feasibility of collecting and analyzing the data and biospecimens needed to better understand the biological basis of exceptional responses in cancer.

"The majority of patients in this study had metastatic cancers that are typically difficult to



Genomic characterizations of cancer can uncover genetic alterations that may contribute to unexpected and long-lasting responses to treatment, according to researchers.

treat, yet some of the patient responses lasted for many years,” said Dr. Louis Staudt, director of NCI’s Center for Cancer Genomics, who co-led the study. “Researchers and the doctors who treat these patients have long been curious about the mechanisms underlying these rare responses to treatment. Using modern genomic tools, we can now start to solve these fascinating puzzles.”

For 26 of the 111 patients, researchers identified molecular features that could potentially explain exceptional responses to treatment, such as the co-occurrence of multiple rare genetic changes in the tumor genome or the infiltration of the tumor with certain types of immune cells.

Dr. Percy Ivy of NCI’s Division of Cancer Treatment and Diagnosis added, “The knowledge gained from studying exceptional responders can help inform how we take care of patients in the future and will help move us closer to the goal of precision oncology.”

Envision Color: Activity Patterns in the Brain Are Specific to the Color You See

Researchers at NEI have decoded brain maps of human color perception. The findings, published Nov. 17 in *Current Biology*, open a window into how color processing is organized in the brain, and how the brain recognizes and groups colors in the environment. The study may have implications for the development of machine-brain interfaces for visual prosthetics.

“This is one of the first studies to determine what color a person is seeing based on direct measurements of brain activity,” said Dr. Bevil Conway, chief of NEI’s unit on sensation, cognition and action, who led the study. “The approach lets us get at fundamental questions of how we perceive, categorize and understand color.”

The brain uses light signals detected by the retina’s cone photoreceptors as the building blocks for color perception. Three types of cone photoreceptors detect light over a range of wavelengths.

The brain mixes and categorizes these signals to perceive color in a process that is not well understood.

To examine this process, Isabelle Rosenthal, Katherine Hermann and Shridhar Singh, post-baccalaureate fellows in Conway’s lab and co-first authors on the study, used magnetoencephalography or “MEG,” a 50-year-old technology that noninvasively records the tiny magnetic fields that accompany brain activity. The technique provides a direct measurement of brain cell activity using an array of sensors around the head. It reveals the millisecond-by-millisecond changes that happen in the brain to enable vision.

The researchers recorded patterns of activity as volunteers viewed specially designed color images and reported the colors they saw.

The researchers worked with pink, blue, green and orange hues so that they could activate the different classes of photoreceptors in similar ways. These colors were presented at two luminance levels—light and dark. The researchers used a spiral stimulus shape, which produces a strong brain response.

The researchers found that study participants had unique patterns of brain activity for each color. With enough data, the researchers could predict from MEG recordings what color a volunteer was looking at—essentially decoding the brain map of color processing, or “mind-reading.”

“The point of the exercise wasn’t merely to read the minds of volunteers,” Conway said. “People have been wondering about the organization of colors for thousands of

years. The physical basis for color—the rainbow—is a continuous gradient of hues. But people don’t see it that way. They carve the rainbow into categories and arrange the colors as a wheel. We were interested in understanding how the brain makes this happen, how hue interacts with brightness, such as to turn yellow into brown.”



Colored stimuli in yellow (top) and blue (bottom). Light luminance level versions are on the left, dark versions on the right. Volunteers used a variety of names for the upper stimuli, such as “yellow” for the left and “brown” for the right, but consistently used “blue” for both the lower stimuli.

IMAGE: BEVIL CONWAY, NEI

Fatigue Study Needs Cancer Survivors

NIH researchers are enrolling cancer survivors to better understand fatigue in people with cancer. Fatigue is a common side effect of cancer and cancer treatment, but it is poorly understood. Research has indicated that cancer-related fatigue may be caused by a number of factors, including immune system responses to cancer treatment. To learn more, or to participate, call the Office of Patient Recruitment, 800-411-1222 (800-877-8339 TTY/ASCII) or email prpl@cc.nih.gov. Refer to study 11-NR-0014. Read more at <https://go.usa.gov/xGcgw>.

Ocular Symptoms in Patients with Confirmed Covid-19 Infection: A Survey Study

Reports have shown that Covid-19 infection can be associated with eye symptoms. Through an online survey, researchers at the National Eye Institute want to learn more about eye symptoms associated with Covid-19 infection. With this survey, investigators hope to discover how common eye symptoms are in Covid-19 infection and how they relate to other Covid-19-associated symptoms. The survey is expected to take 10 to 20 minutes. You do not need to have had any eye symptoms in order to participate. You may participate if you are at least 18 years of age with a history of a confirmed positive Covid-19 test. Join by visiting <https://go.usa.gov/x7Tjh> or email eyecovid-19@nih.gov.

Patients with Sickle Cell Disease Sought for NHLBI Study

Researchers at NHLBI are now recruiting patients with sickle cell disease to participate in a new clinical trial. This study will evaluate the effects of a natural supplement (Isoquercetin) on the markers reflecting blood-clotting risks in patients with sickle cell disease. To learn more, contact the Clinical Center Office of Patient Recruitment at 866-444-2214 (TTY 800-877-8339) or prpl@cc.nih.gov. Refer to study 20-H-0137. Read more at <https://go.usa.gov/x7TDY>.

Healthy Volunteers Needed

NIDDK researchers seek healthy volunteers (18-45 years old) to participate in a study investigating how dopamine affects body weight and eating behavior. Participants must be able to visit the Clinical Center for 5 consecutive days to pick up food and then have a 5-day inpatient stay. For more information, call the Clinical Center Office of Patient Recruitment, 1-866-444-2214 (TTY for the deaf or hard of hearing: 1-866-411-1010) or email prpl@cc.nih.gov. Read more at <https://go.usa.gov/xPTBn>. Refer to study 18-DK-0132.



Underwater Wonders

This photo was snapped in February 2020, a few weeks before stay-at-home orders went into effect. NIAID's Dr. Merriline Vedamony took it at the aquarium inside the Smithsonian National Museum of Natural History. "This image was so vibrant and the color contrast between the iridescent corals and the jewel bright fish was mesmerizing," she said. The museum remains temporarily closed.

Found: New Appreciation for Natural Incline

"For over 25 years, I've hiked and backpacked the many trails in Shenandoah National Park, but I had yet to ride my bike on Skyline Drive," said Jennifer L. Marill, chief of NLM's Technical Services Division. "On a crisp, cool day in September, with other vacation plans cancelled due to the pandemic, I took leave from work to try it out. While I knew Skyline Drive was long and winding, I never quite realized just how hilly it was until I was on my bike!"

